Report to Meeting of CIE Division 2 – 2-Jul-2003 – San Diego, USA

R2-05 Visual Gloss

There is an amount of anecdotal evidence that the methods of measuring visual gloss described in BS EN ISO 2813 *Paints and varnishes – Determination of specular gloss of non-metallic paint film at 20 , 60 and 85* and ASTM D523 – *Standard Test Method for Specular Gloss* (intended for the measurement of non-metallic specimens) do not give numbers that correlate with visual impression. That this is true is probably compounded by the fact that users are applying the methods to materials for which they were not originally intended. I would appreciate input from any D2 members to try to substantiate this claim.

ISO TC 130/WG4 *Graphic technology/Media and materials* is leading a series of experiment with the aim of producing a new measure of visual lustre. This measure is based on the ratio of the diffuse reflectance to the specular reflectance with the illumination is set at 45 and visual data for a number samples have been obtained from groups in Germany, Japan, Switzerland and the UK. The samples include a number of different paper types unprinted and printed with cyan, magenta, yellow and black ink. There are potential problems in that the measurements obtained by the different countries, using different instruments, are not all correlated, and the visual experiments differ in detail in the different countries. Further analysis of the data is awaited. A committee draft standard is available *Graphic technology – testing of prints – Visual lustre* although this is proving contentious.

INCITS W1.1 *Standardisation for Evaluation of Perceptual Macro-Uniformity for Printing Systems* is developing test targets and procedures for evaluating the uniformity of gloss on the printed page. This committee is the US representative of ISC/IEC JTC1/SC28 *Office Equipment*. The committee is concerned with the overall appearance of the uniformity of the printed page and, while colour is obviously an issue, gloss is known to be an important contributor to the appearance. The committee aims to:
  define the relevant varying attribute (measure) based on appearance,
  design a series of digital test targets,
  create a collection of hard copy test samples spanning a diverse range of marking
    technologies, image quality levels and defect types,
  digitise these hard copy sample images,
  perform surveys to obtain subjective ratings of the hardcopy samples,
  develop objective metrics for quantification of the attribute – these metrics to be
    appearance based, in the sense that they scale with the human visual perception of the
    attribute.
These steps will be followed by a further series to test and establish correlations between the objective and subjective measures of the attribute.

A student at the University of Derby, has conducted a number of studies in the area of visual gloss and then gone on to develop a method of measuring gloss based on digital imaging.

A number of samples were prepared with different colours and gloss levels and a pilot study carried out using two different Macbeth® viewing devices: the SpectraLight® and the SkyLight®. This pilot investigation showed that both viewing conditions gave very similar visual results in terms of gloss. The main experiment was carried out using only the SpectraLight® viewing condition. All samples were assessed 20 times by 14 observers.

An instrumental method was developed based on the measurements of two reflectance functions using a spectrophotometer (each sample was measured using specular component included and specular component excluded conditions). These data are then converted to two sets of CIE tristimulus values (*XYZ*). The difference in Y tristimulus value ($\Delta Y_{SCI-SCE}$) gives an accurate prediction of the perceived gloss results.

An imaging system was configured including a digital camera and a fixed illumination and viewing (10 /0) geometry. Two digital imaging system methods based on the concept of a distance profile were developed for measuring gloss and both gave satisfactory performance compared with the visual data.

At the Quadrennial meeting in San Diego, CIE D1 established a technical committee, TC1-65 *Visual Appearance Measurement*, and I was appointed chairman. The Terms of Reference of the TC are:

> To study, develop and recommend a soft-metrology framework for measuring visual appearance. This should include potential measurement areas, psychophysical procedures and real applications.

The work of this Technical Committee will include the visual assessment and the instrumental measurement of gloss in all its definitions. The following have asked to join the TC: Jim Nobbs (UK), Ronnie Luo (UK), John Hutchings (UK), Claudio Oleari (IT), Osvaldo da Pos (IT), Françoise Viénot (FR), Gunilla Derefeldt (SE), Jim Leland (US), Richard Harold (US).

There is also a sub-committee within ASTM E12 *Color and Appearance* that deals with *Visual Methods* – I am chair of this sub-committee and am now responsible for a number of ASTM Methods involving gloss.

I recommend that, with the establishment of TC1-65 in Division 1, this D2 reportership be disbanded and a new reportership established with the title *Visual Appearance Measurement*; I am happy to be this reporter.

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